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IS 14589 (1999): Zinc priming paint,epoxy based ,two pack -Specification [CHD 20: Paints, Varnishes and Related Products]

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Indian Standard

ZINC PRIMING PAINT, EPOXY BASED, TWO-PACK — SPECIFICATION

ICS 87.060.99

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

April 1999 **Price Group 3**

Industrial Paints Sectional Committee, CHD 031

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Industrial Paints Sectional Committee had been approved by the Chemical Division Council.

Zinc paints find a wide range of applications for corrosion protection of iron and steel. These paints can be used alone but usually employed as primer coat as a part of the protective system for long term corrosion protection. Zinc pigmented paints are also used as prefabrication primers for the protection of abrasive blast cleaned steel plates and fabricated components of ships and other structures. Repair of damaged galvanized and metallic zinc sprayed coatings is carried out by using metallic zinc paints.

This standard has been prepared with the aim to cater for the requirements of zinc paints for use as primers and prefabrication paints having different degree of corrosion protection.

For testing purposes, appropriate panels of specified size shall be used. The panels may be cleaned first using suitable solvent like mineral spirit and then through abrasive blast using sand or chilled grit of appropriate size [*see* IS 1477 (Part 1) : 1971 'Code of practice of painting of metals in buildings: Part 1 Pre-treatment (*first revision*)' and IS 9954 : 1981 'Pictorial surface preparation standards for painting of steel surfaces'; for guidance]. These may be further cleaned by using brush, degreasing and drying. Surface profile of panels, prepared in such a way, lie between 25-35 microns. Care, however, is required to be taken to prevent contamination of panels during cleaning and testing.

The satisfactory performance of zinc containing paints depends largely on their capacity to attain close contact between zinc particles and iron and steel surface to be protected. The close electrical contact permits in achieving adequate galvanic protection of the steel substrate especially under marine conditions. To ensure such electrical contact it becomes essential to remove all mill scale, rust and any other contamination from the steel surface to be painted. The zinc paints, therefore, shall be applied only to very carefully prepared steel, preferably abrasive blast cleaned surface close to Sa_3 quality to Swedish standard. It is important to control the surface roughness. This is mainly achieved by the selection of correct size of grit or shot and appropriate air pressure. The profile height obtained shall lie between 50-75 microns (*see* IS 3073 : 1967 'Assessment of surface roughness' and IS 10707 : 1983 'Instruments for measurement of surface roughness by profile methods'; for guidance).

Composition of the Committee responsible for the formulation of this standard is given in Annex F.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ZINC PRIMING PAINT, EPOXY BASED, TWO-PACK — SPECIFICATION

1 SCOPE

This standard prescribes requirements and methods of sampling and test for zinc priming paint, epoxy based in two-pack, used for the corrosion protection of steel and fabricated structures.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this Indian Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate by dated or undated the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1303 shall apply.

4 GRADES

There shall be two grades as given below.

4.1 Grade 1

Paint priming zinc, prefabrication – for protection of abrasive blast cleaned steel and fabricated components.

4.2 Grade 2

Paint priming zinc – used alone or as primer coat for paint systems.

5 REQUIREMENTS

5.1 Composition

The primer shall be based on a two-pack epoxy binder cured with polyamide and solvent, depending upon requirements and pigmented with zinc dust and suitable extenders. The metallic zinc content when calculated, as given in Annex B, on the non-volatiles portion of the paint for grade 1 shall be not less than 65 percent (by mass) and for grade 2 shall be not less than 85 percent (by mass).

5.2 Metallic zinc dust used in the formulation shall be as per grade 2 of IS 4611.

5.3 The mixing proportion of two component material shall be a simple ratio by mass.

5.4 Mass per 10 Litres

The mass of 10 litres of the material when determined by method described in IS 101 (Part 1/Sec 7) shall be between 15-18 kg for grade 1 and minimum 21.5 kg for grade 2.

5.5 The materials for grade 1 and grade 2 shall also comply with the requirements given in Table 1.

Table 1 Requirements of Zinc Priming Paint, Epoxy Based, Two-Pack

Sl No.	Characteristics	Requirements		Methods of Test, Ref to IS 101 and Annex
		Grade 1	Grade 2	
(1)	(2)	(3)	(4)	(5)
i)	Consistency	Paint shall be in such a condition that power mixing produces a smooth and uniform paint suitable for application		Part 1/Sec 5
ii)	Drying time, *Max*	–	30 min	Part 3/Sec 1
iii)	Finish	Smooth and matt		Part 3/Sec 4
iv)	Colour	Grey	Grey	Part 4/Sec 2
v)	Volatile matter, percent by mass, *Max*	45	30	Part 2/Sec 2
vi)	Pigment content, percent by mass, *Min*	50	65	Part 8/Sec 2
vii)	Volume solids, percent by mass, *Min*	28	35	Part 8/Sec 6
viii)	Dry film thickness, microns, *Min*	20	45	Part 3/Sec 2
ix)	Flash point, °C, *Min*	15	15	Part 1/Sec 6
x)	Protection against corrosion under condensation conditions using abrasive blasted steel panel	10 days	28 days	Part 6/Sec 1
xi)	Resistance to salt spray[1]	8 days	30 days	Annex C
xii)	Effect of welding	To pass the test		Annex D
xiii)	Keeping quality	Not less than 1 year		Part 6/Sec 2
xiv)	Pot life, *Min*	6 h	6 h	Annex E

[1] This test shall be done at approval stage only.

6 PACKING AND MARKING

6.1 Packing

The material shall be packed as agreed to between the purchaser and the supplier.

6.2 Marking

The material shall be marked with the following particulars:

a) Name and grade of the material;
b) Indication of the source of manufacture;
c) Net mass of the material;
d) Batch No. or lot No., in code or otherwise; and
e) Month and year of manufacture.

6.2.1 *BIS Certification Marking*

The product may also be marked with Standard Mark.

6.2.1.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details or conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7 SAMPLING

Representative samples of the materials shall be drawn as prescribed in IS 101 (Part 1/Sec 1).

8 TEST METHODS

8.1 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in tests.

NOTE — 'Pure chemical' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
101	Methods of sampling and test for paints, varnishes and related products:
(Part 1/Sec 1) : 1986	Test on liquid paints (general and physical), Section 1 Sampling (*third revision*)
(Part 1/Sec 5) : 1989	Test on liquid paints (general and physical), Section 5 Consistency (*third revision*)
(Part 1/Sec 6) : 1987	Test on liquid paints (general and physical), Section 6 Flash point (*third revision*)
(Part 1/Sec 7) : 1987	Test on liquid paints (general and physical), Section 7 Mass per 10 litres (*third revision*)
(Part 2/Sec 2) : 1986	Test on liquid paints (chemical examination), Section 2 Volatile matter (*third revision*)
(Part 3/Sec 1) : 1986	Tests on paint film formation, Section 1 Drying time (*third revision*)
(Part 3/Sec 2) : 1989	Tests on paint film formation, Section 2 Film thickness (*third revision*)
(Part 3/Sec 4) : 1987	Test on paint film formation, Section 4 Finish (*third revision*)
(Part 4/Sec 2) : 1989	Optical tests on paint films, Section 2 Colour (*third revision*)
(Part 6/Sec 1) : 1988	Durability tests on paint films, Section 1 Resistance to humidity under conditions of condensation (*third revision*)
(Part 6/Sec 2) : 1989	Durability tests on paint films, Section 2 Keeping properties (*third revision*)
(Part 8/Sec 2) : 1990	Tests for pigments and other solids, Section 2 Pigments and non-volatile matter (*third revision*)
(Part 8/Sec 6) : 1993	Tests for pigments and other solids, Section 6 Volume solids
513 : 1994	Cold rolled low carbon steel sheets and strips (*fourth revision*)
1070 : 1992	Water for general laboratory use (*third revision*)
1303 : 1983	Glossary of terms relating to paints (*second revision*)
1499 : 1977	Method for charpy impact test (U-notch) for metals (*first revision*)
1608 : 1995	Mechanical testing of metals — Tensile testing (*second revision*)
4611 : 1991	Metallic zinc powder (zinc dust) (*second revision*)

ANNEX B

(*Clause* 5.1)

DETERMINATION OF METALLIC ZINC

B-0 GENERAL

Metallic zinc is estimated by determining the total reducing power by dissolving it in acidulated ferric chloride solution and titrating with standard potassium permanganate solution.

B-1 REAGENTS

B-1.1 Standard Potassium Permanganate Solution (0.1 N)

Heat 5 g of potassium permanganate ($KMnO_4$) for one hour at 100 ± 2°C. Dissolve 3.16 g of potassium permanganate in water and dilute it to one litre. Allow it to stand for 7 days. Filter through a medium porosity fritted disc and standardize against sodium oxalate as follows:

Dissolve 0.25 to 0.30 g of sodium oxalate in 250 ml of hot water (90-90°C) and add 15 ml sulphuric acid (1 : 1). Titrate at once with $KMnO_4$ solution, stirring the liquid vigorously and continuously. $KMnO_4$ solution must not be added more rapidly than 10 to 15 ml/minute and the last 0.5 to 1 ml shall be added dropwise with particular care to allow each drop to be fully decolourised before the next drop is introduced. The solution shall not be below 60°C by the time the end point has been reached. Keep $KMnO_4$ solution in a brown glass-stoppered glass bottle and store in a dark place.

B-1.2 Ferric Chloride Solution

Prepare a solution containing 20 g of ferric chloride ($FeCl_3$, $6H_2O$) and 20 ml of 20 percent sodium solution. It is advisable to make up one day's requirement at a time.

NOTE — 50 ml of solution is normally required for one determination.

B-1.3 Sodium Acetate Solution

Dissolve 200 g of anhydrous sodium acetate ($NaC_2H_3O_2$) or 332 g of $NaC_2H_3O_2$, $3H_2O$ in water and dilute it to 1 litre.

B-1.4 Zimmerman-Neinhardt Solution

Prepare one litre of solution, containing 67 g of manganese sulphate ($MnSO_44H_2O$), 130 ml of sulphuric acid (sp gr 1.84) and 138 ml of phosphoric acid (85 percent).

B-2 PROCEDURE

B-2.1 Weigh 0.2 g of the sample of the pigment. Transfer immediately to a dry 600 ml heavy-wall Erlenmeyer flask and add 50 ml of the ferric chloride solution. Tightly stopper the flask and agitate constantly for approximately 15 minutes. As soon as all zinc dust is dissolved, add 50 ml of the Zimmerman-Reinhardt solution and 250 ml of water. Titrate with 0.1 N potassium permanganate solution.

B-2.2 Making a blank determination, following the same procedure and using the same amounts of reagents except the pigment.

B-3 CALCULATION

Calculate the percent of metallic zinc as follow :

$$\text{Metallic zinc, percent by mass} = [(V-B) \times N \times 0.032\,7/W]\,100$$

where

V = ml of $KMnO_4$ solution required for titration,

B = ml of $KMnO_4$ solution required for titration of blank,

N = 'Normality' of the $KMnO_4$ solution, and

W = 'Grams' of sample used.

NOTE — If specifically desired, metallic zinc content may be determined as per ASTM D 521 – 90 Standard test methods for chemical analysis of zinc dust (metallic zinc) powder, as an alternative method.

ANNEX C

[*Table* 1, *Sl No.* (xi)]

RESISTANCE TO SALT SPRAY TEST

C-0 GENERAL

The coated panels are subjected to salt spray for stipulated number of days and the film is examined for any deterioration.

C-1 PROCEDURE

C-1.1 Prepare test panels of size 150 mm × 1.5 mm of mild steel conforming to Type DD of IS 513 through abrasive blast (*see* Foreword). Apply a coat of the primer by spraying to produce desired dry film thickness and allow to dry for seven days. In the middle of panel make a scribe mark extending up to metal, each mark 50 mm long using a cutting edge at least 0.75 mm wide. Expose the painted panels to salt water spray test continuously as described in **3** of IS 101 (Part 6/Sec 1) for the specified test period. However, if specifically desired by the purchaser, intermittent exposure of the panels to artificial sea water test as described in **4** of IS 101 (Part 6/Sec 1) may also be carried out.

C-1.2 Examine the panel visually for any film deterioration and corrosion of the steel. Crippage shall not be more than 3 mm on either side of the scribe lines for passing the test.

ANNEX D

[*Table* 1, *Sl No.* (xii)]

DETERMINATION OF EFFECT OF WELDING

D-0 GENERAL

The mild steel plates coated with the prefabrication primer are welded and the weld is examined for porosity and mechanical properties along with a control weld assembly.

D-1 PROCEDURE

D-1.1 Test Plate

Use mild steel plates of size 500 mm × 150 mm × 20 mm for making the weld test assemblies. A single U-notch is made on longitudinal edge of each panel.

D-1.2 Preparation of Weld Assembly

Abrasive blast (*see* Foreword) two plates including the edges and cast them with prefabrication primer as per manufacturer's instructions keeping the dry film thickness within 40 to 50 microns. Allow the primer coat to dry for seven days. Prepare the test assembly by welding the plates together using appropriate consumable electrodes. Abrasive blast the control assembly plates and weld in a similar fashion.

D-1.3 Examination of Test Assemblies

The test assemblies shall be examined for the tests given below:

a) *Radiographs* — These shall have a sensitivity of better than 2 percent of the plate thickness under examination as shown by an image quality indicator.

b) *Photo-macrographs* — These may be of actual size and shall be taken from near each end and the centre of the weld.

c) *Face and reverse bend test* — The test specimens shall be bent by pressure round a former of diameter equal to three times of the plate thickness.

d) *Impact tests* — These shall be carried out at ambient temperature of three charpy U-notch test specimens prepared in accordance with IS 1499. The specimens shall be notched at the central line of the weld, perpendicular to the plate surface.

e) *Tensile test* — Ultimate tensile strength shall be determined in accordance with IS 1608 keeping the weld joint in the middle of the test place.

D-1.4 The primer shall be deemed to have passed the test if porosity in primer coated weld assemblies does not exceed 10 percent than that of control weld assemblies. The results of other tests on welds with primer shall not be below the minimum specified values of control welds.

ANNEX E

[*Table* 1, *Sl No.* (xiv)]

DETERMINATION OF POT LIFE

E-1 Condition the components of the coating for one hour at 25°C and mix immediately in proper ratio to fill the quart can to approximately 1.25 cm of the top. The lid may be loosely placed on the can.

E-2 Measure the viscosity initially and every hour thereafter; however the interval may be shortened if desired.

E-3 Viscosity builds up rapidly near the end of working life of the coatings. During this period if the coating becomes too viscous to spray, remove a small portion and add appropriate thinner. If the paint could still be thinned, the end of working life has not been reached. The end of the working life is reached when the test material (paint) gels, becomes stringy or cannot be thinned for application.

E-4. Report the working life in the approximate time units.

ANNEX F

(*Foreword*)

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This Indian Standard has been developed from Doc: No. CHD 31 (8516).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Dee Kay Printers, New Delhi, India